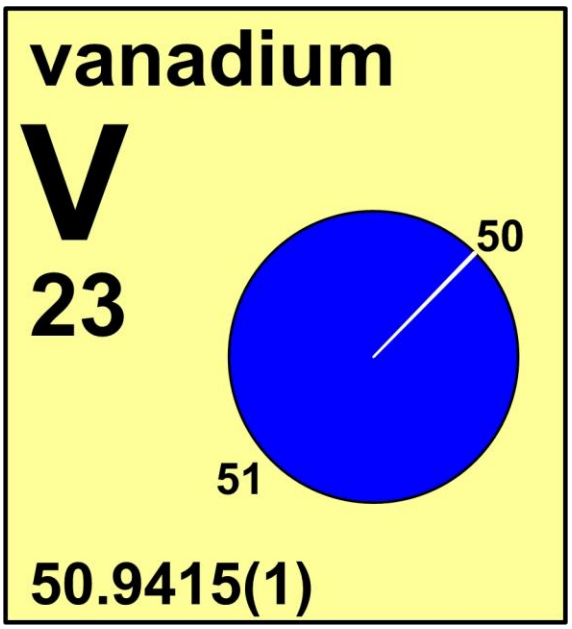
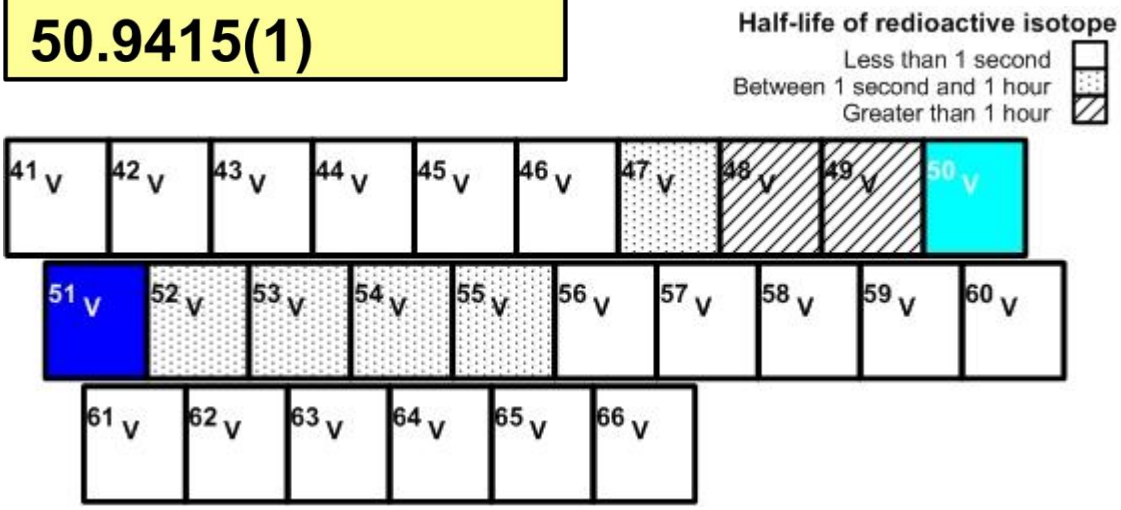
vanadium



Stable isotope	Atomic mass*	Mole fraction
^{50}V	49.947 1585	0.002 50
^{51}V	50.943 9595	0.997 50

* Atomic mass given in unified atomic mass units, u.



Important applications of stable and/or radioactive isotopes

Isotopes in medicine

1) ^{51}V is a cofactor of enzymes essential in energy metabolism.
2) Vanadium might have a future role in the management of diabetes. *In vitro*, vanadium salts reveal similar effects to that of insulin on the main target tissues and *in vivo* they have been shown to create a sustained fall in blood glucose levels in insulin-deficient diabetic rats, and improve glucose homeostasis in obese, insulin-resistant diabetic rodents.

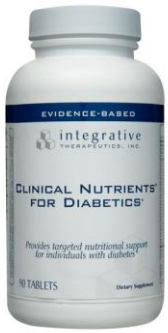


Figure 1: Vanadium may be effective in management of diabetes.

Isotopes in materials science

1) ^{51}V is used extensively in solid state Nuclear Magnetic Resonance (NMR) to provide information about surface species of oxide-supported vanadium catalysts, their interaction with the supporting material, and with the reacting molecules during the catalytic processes.

Isotopes in cosmochemistry

1) The isotopic abundances of ^{50}V and ^{51}V have been used as an indicator of planetary core formation processes. Vanadium is greatly depleted in the earth's mantle compared with chondritic meteorites (meteorites entering our atmosphere from outer space). It is assumed that the deficit on Vanadium on the earth's crust is accounted for by its partitioning into the core.
2) The isotopic ratios of ^{50}V and ^{51}V have been used as a test of the X-wind model, which accounts for a portion of the extinct radioactive nuclides present in the early solar system by radiation from the young sun.

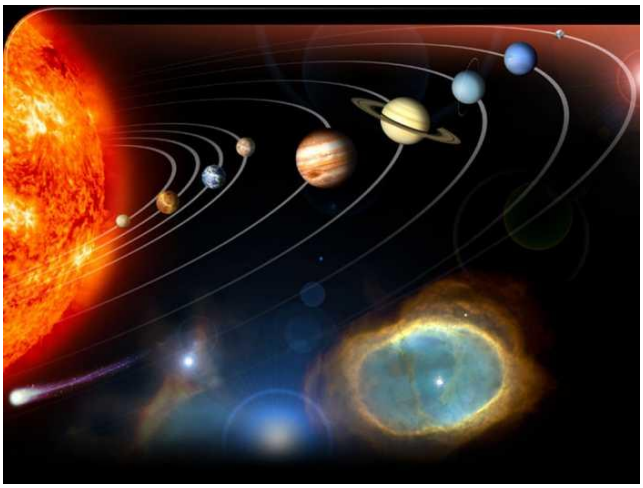


Figure 2: Vanadium isotopes can help test the X-Wind model, which accounts for a portion of the extinct radioactive nuclides present in the early solar system by radiation from the young sun.